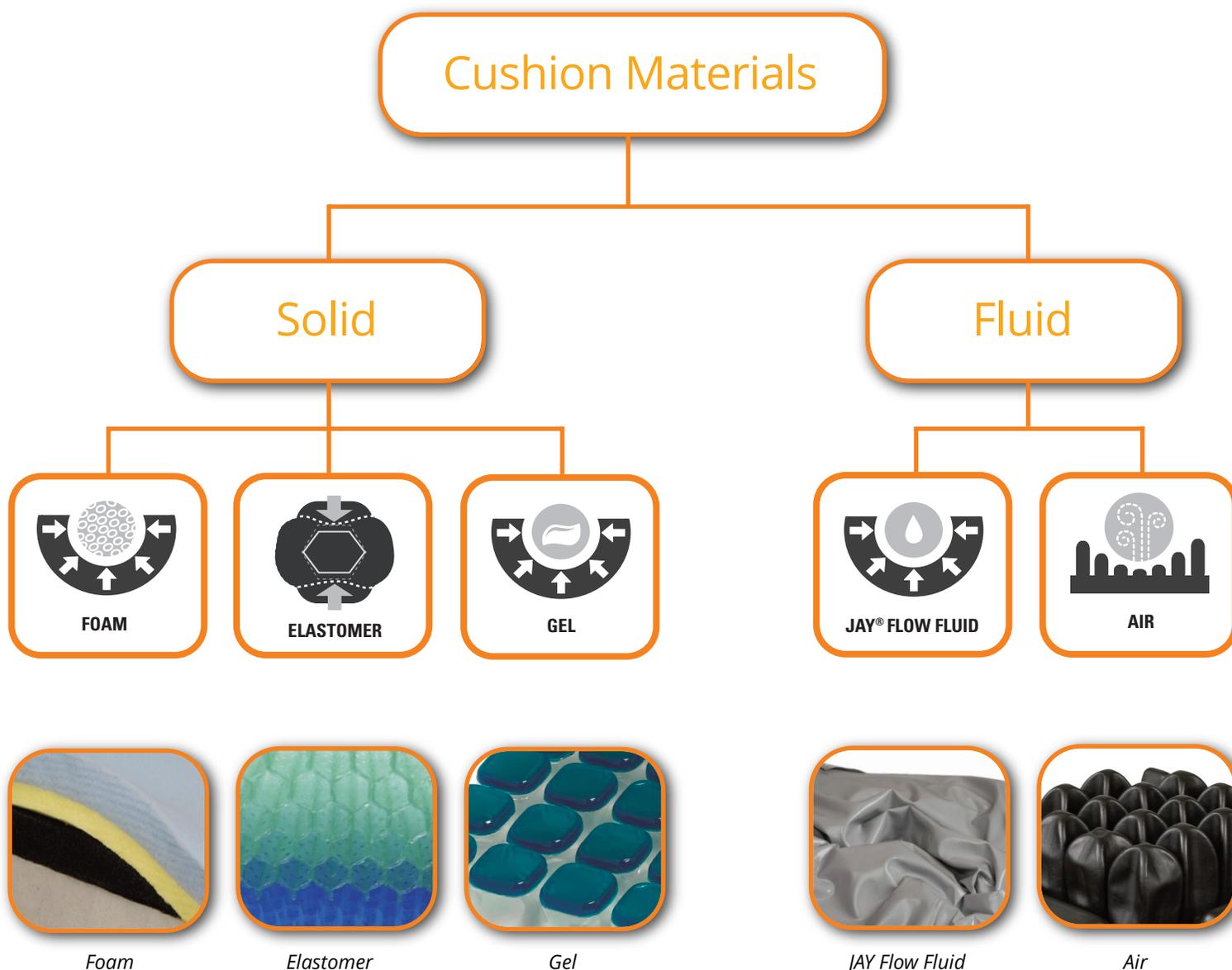


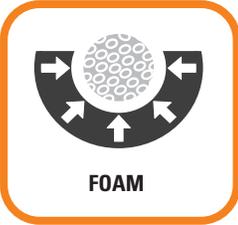
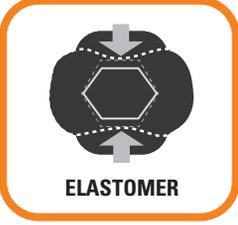
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## Material Selection in Cushions

Although cushions may look similar in design on the outside, the materials used on the inside can have a significant impact on their performance. Understanding how materials perform will improve the clinician's ability to select a cushion based on their client's goals. This reference table describes material, their benefits and the clinical considerations when selecting the most appropriate wheelchair cushion.



# Material Selection in Cushions (Continued)

MATERIAL	Description	Clinical Benefits	Additional Considerations
 <p style="text-align: center;"><b>FOAM</b></p>	<p><b>Foam</b> is a material which is formed by trapping pockets of gas. It can be a variety of densities, firmnesses and weights. Based on the uniformity of the cells, they will be more or less rigid.</p> <p>Closed cell foam has a uniform cell structure which creates rigidity.</p> <p>Open cell foam is softer due to a less uniform cell structure.</p> <p>The weight of a foam is dependent upon mass, not upon firmness or density. Therefore rigid foam may also be lightweight, whereas softer foam may be heavier.</p> <p>Memory foam (viscoelastic) has increased viscosity and density which allows it to return slowly to its shape after compression.</p>	<p>Inexpensive and lightweight</p> <p>Low maintenance</p> <p>Absorbs impact loads well</p> <p>Firm foam can provide a level base of support</p> <p>Soft foam can be used for comfort</p> <p>Viscoelastic memory foam has vibration dampening properties</p> <p>Various densities can be combined for pressure relief, moving load from high risk bony prominences to lower risk areas</p>	<p>Compresses over time</p> <p>Difficult to clean and absorbs moisture</p> <p>May create tension on the tissue depending on the softness of the foam</p> <p>May create shear forces on the tissue depending on the foam design</p> <p>May retain heat in hot climates and get harder in cold climate</p> <p>Memory foam may hold more heat than standard foam and it becomes more compressed over time, with less return</p> <p>May increase pressure on bony prominences over time</p>
 <p style="text-align: center;"><b>ELASTOMER</b></p>	<p><b>Elastomer</b> is a man-made polymer with varying degrees of viscoelasticity.</p> <p>In wheelchair cushions, an elastomer is often a matrix-like polymer structure.</p> <p>Immersion is dependent upon the softness of the elastomer. It has a greater durability than foam over time.</p>	<p>Easy to clean</p> <p>Allows some compression</p> <p>Immersion is dependent upon the rigidity of the elastomer</p> <p>Can be lightweight depending on design, e.g. honeycomb structure</p> <p>Design may allow airflow which may improve microclimate</p> <p>Has shear reduction qualities due to higher viscoelasticity properties</p>	<p>Limited displacement</p> <p>Less immersive than lower density foam or fluids</p> <p>More difficult to customize in the field in response to specific postural needs</p>
 <p style="text-align: center;"><b>GEL</b></p>	<p><b>Gel</b> is a solid jelly-like material that can have properties ranging from soft and weak to hard and tough.</p> <p>Although it is mostly liquid, it behaves like a solid. Therefore, it has some viscosity, but does not allow for complete immersion.</p> <p>Gel maintains its shape even when opened or cut.</p>	<p>Some movement and viscosity</p> <p>Often easy to cut, modify and put in small places</p> <p>Can offer good friction/shear control</p> <p>Easy to clean</p>	<p>Heavy</p> <p>Temperature sensitive</p> <p>Holds heat but can feel cold to the touch initially</p> <p>Limited displacement, less immersion than liquid, air, or most foams used in cushions</p>

# Material Selection in Cushions (Continued)

MATERIAL	Description	Clinical Benefits	Additional Considerations
	<p><b>JAY Flow Fluid</b> is a non-Newtonian fluid. A non-Newtonian fluid remains in a semi-solid or highly viscous state.</p> <p>In a non-Newtonian fluid, viscosity changes when under force to either more liquid or more solid.</p> <p>Although a non-Newtonian fluid can take a shape without a container, it will flow with pressure. Therefore, it needs to be contained when used in a cushion.</p>	<ul style="list-style-type: none"> <li>Good pressure distribution</li> <li>Conforms to the body</li> <li>Weighs less than gel</li> <li>Moves with the body</li> <li>Can help control shear</li> <li>Does not respond to load with counterforce of foam, thereby extremely good for pressure care</li> <li>Provides good immersion while creating a large area of surface contact to distribute</li> </ul>	<ul style="list-style-type: none"> <li>Heavier than foam or air</li> <li>Needs some maintenance</li> <li>May require redistribution following use due to migration with pressure</li> </ul>
	<p><b>Air</b> is a Newtonian fluid. A Newtonian fluid maintains its viscosity independent of stress. A Newtonian fluid only changes its viscosity in response to temperature.</p> <p>If you provide a Newtonian fluid with stress, it will remain the same thickness (viscosity), but if you heat it up or cool it down it can become more liquid or more solid.</p> <p>Newtonian fluid, such as air or water, cannot maintain a shape without a container. However, if the container is opened, it will spill and be released, thereby negating its efficacy.</p>	<ul style="list-style-type: none"> <li>Lightweight</li> <li>Moves with the body</li> <li>Easy to clean</li> <li>Pressure distribution</li> <li>Can be used as entire cushion or within a foam base for stability</li> <li>Provides good immersion while creating a large area of surface contact to distribute</li> </ul>	<ul style="list-style-type: none"> <li>Reduced stability, particularly in an air-only cushion</li> <li>Risk of puncture</li> <li>Frequent maintenance to ensure proper inflation</li> <li>Sensitive to pressure changes, such as during air travel</li> </ul>

## References

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3. Watanabe, L. (2017, September). Immersion, envelopment and off-loading. Mobility Management. Retrieved from: <https://mobilitymgmt.com/Articles/2017/09/01/Seating-Strategies.aspx>

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